



Rising atmospheric carbon dioxide and potential impacts on the growth and toxicity of poison ivy (*Toxicodendron radicans*)

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Year: 2007
Journal: Weed Science. 55 (4): 288-292

Abstract:

Because of its ability to induce contact dermatitis, the establishment and spread of poison ivy is recognized as a significant public health concern. In the current study, we quantified potential changes in the biomass and urushiol content of poison ivy as a function of incremental changes in global atmospheric carbon dioxide concentration (CO₂). We also examined the rate of new leaf development following leaf removal to simulate responses to herbivory as functions of both CO₂ and plant size. The experimental CO₂ values (300, 400, 500, and 600 $\mu\text{mol mol}^{-1}$) corresponded approximately to the concentration that existed during the middle of the 20th century, the current concentration and near and long-term projections for this century (2050 and 2090), respectively. Over 250 d, increasing CO₂ resulted in significant increases in leaf area, leaf and stem weight, and rhizome length relative to the 300 $\mu\text{mol mol}^{-1}$ baseline with the greatest relative increase occurring from 300 to 400 $\mu\text{mol mol}^{-1}$. There was a nonsignificant (P Euro Surveillance (Bulletin European Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.18) increase in urushiol concentration in response to CO₂; however, because of the stimulatory effect of CO₂ on leaf biomass, the amount of urushiol produced per plant increased significantly for all CO₂ above the 300 $\mu\text{mol mol}^{-1}$ baseline. Significant increases in the rate of leaf development following leaf removal were also observed with increasing CO₂. Overall, these data confirm earlier, field-based reports on the CO₂ sensitivity of poison ivy but emphasize its ability to respond to even small (similar to 100 $\mu\text{mol mol}^{-1}$) changes in CO₂ above the mid-20th century carbon dioxide baseline and suggest that its rate of spread, its ability to recover from herbivory, and its production of urushiol, may be enhanced in a future, higher CO₂ environment. Nomenclature: Poison ivy, *Toxicodendron radicans* (L.) Kuntze TOXRA.

Source: <http://dx.doi.org/10.1614/WS-06-190>

Resource Description

Exposure : ☒

weather or climate related pathway by which climate change affects health

Air Pollution, Other Exposure, Other Exposure, Unspecified Exposure

Other Exposure: Poison ivy

Geographic Feature: ☒

resource focuses on specific type of geography

Climate Change and Human Health Literature Portal

None or Unspecified

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Dermatological Effect, Other Health Impact

Other Health Impact: Poison ivy

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified